

# SCIENCE.

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FRIDAY, NOVEMBER 5, 1886.

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## COMMENT AND CRITICISM.

SMALL-POX IS REPORTED to be quite prevalent in Brooklyn. During the past three weeks, twenty-two cases have been reported at the health office of that city. While this should not excite alarm, it should arouse all persons to the necessity of being vaccinated. This applies not only to parents whose children have never been vaccinated, but also to adults who have never been re-vaccinated since their infancy or childhood. We are in little danger in this country of suffering from the attacks upon this method of prevention of a most loathsome disease by the anti-vaccinationists, but we are always in danger of outbreaks of small-pox so long as there is public apathy and neglect in obtaining the necessary protection. So long a time has elapsed since small-pox prevailed in the United States, that there are doubtless tens of thousands who are to-day unvaccinated; and, should this disease once become disseminated, it will find so many victims that a wide-spread and long-continued epidemic may result. The experience of Canada two years ago should be a lasting warning to every nation, state, and city throughout the civilized world. Three thousand deaths in Montreal, and five hundred infected houses, was the tribute paid by one city alone to the anti-vaccinationists.

IN ALL, 3,372 members and associates presented together 522 papers during the recent meeting of the German association of physicians and naturalists. The American association for the advancement of science registered at Buffalo 450 members and associates, including ladies, and had a programme of 247 papers. One thing, however, must not be ignored in this connection. The geological congress of Germany held its annual meeting at Darmstadt, two days after the naturalists and physicians adjourned, and most of the geological papers were undoubtedly reserved on that account. Similar drawbacks may have existed for the other sections of exact sciences, which would naturally interfere with the presentation of a large number of papers, — more so, as the whole

organization is merely one for social intercourse primarily. The unstability of such an association is, however, beginning to be understood; and a committee of twelve has been appointed to report on a new constitution next year at Wiesbaden, and a permanent organization similar to those of England and America, will, in all probability, be the result. The city of Berlin appropriated about eighteen thousand dollars for the entertainment of the visitors, and the generosity and courtesy of the individual citizens cannot be lauded too highly. With the exception of hotel accommodations, which were poor at best, every thing was done by the local committee to make their guests comfortable, — in view of the large numbers present, no small undertaking indeed (3,372 members and associates, and 1,475 ladies). There was also an exhibition of scientific instruments and apparatus designed expressly for the visitors. Every thing pertaining to medical and sanitary science, electrical appliances, microscopes, model collections for school purposes, geological maps and models, etc., found here its place in the well-adapted halls of the Academy of fine arts. It seems that the German scientists are strongly in favor of helping in the formation of an international scientific congress, and any movement made in that direction will receive a most hearty support.

ANOTHER INSTANCE tending to establish the contagiousness of tuberculosis is reported in the *Gazette médicale* of Paris. It appears, from the account there given, that a young man living in a small French village contracted bronchitis. He subsequently married a healthy girl. Within a year he died of consumption, and soon after his widow also developed the disease. Their child, not long after, became a victim to the same disease. Not far from the home of this family resided a robust young woman who had at infrequent times visited her sick neighbors, but had never staid with them any time. She had, however, eaten the flesh of fowls which had died at the farm of the invalid, and, believing that these were most nutritious when partially cooked, had eaten them in this condition. About this time another fowl died, and an examination showed it to be affected

with tuberculosis, the tubercles in the liver containing the characteristic bacilli of the disease. Upon inquiry, it was found that the expectoration of the consumptive person had been eaten by the fowl. From the history given of the other fowls, it is probable that they died from the same affection. It has for some time been recognized that the milk of tubercular animals could convey this disease to man; and, if the explanation just given is a true one, a new source of danger, hitherto unsuspected, exists. That such a method of communication is probable cannot be denied, and should direct the attention of both physicians and patients to the absolute necessity of the disinfection of the sputa of consumptives.

THE RECENT DEATH of a lady in a Brooklyn dentist's chair has already been reported in *Science*. The coroner's jury, after an investigation, exonerated the dentist and his assistants. The lady, it appears, had called to have a tooth extracted, and the anaesthetic employed was the bromide of ethyl. The patient became conscious after the anaesthetization, but suddenly became unconscious, and in half an hour was dead. The dentist testified that he had employed the bromide at least once a day for nine months without previous injurious result. The jury recommended that in all doubtful cases patients should be thoroughly examined by a competent medical man before the administration of an anaesthetic for dental operation. Even this precaution will not always prevent disastrous results, for numerous cases of death after anaesthesia are recorded where a physical examination revealed no organic disease. It would perhaps be the best advice to give, that, when so trifling a pain is to be borne as is caused by the extraction of a tooth, persons should bear it without an anaesthetic rather than run any risk, no matter how trivial it may seem to be.

#### ALLEGED EARLY CHINESE VOYAGES TO AMERICA.

MUCH interest was excited in the Société de géographie at Paris by a paper by Dr. Hamy on 'The interpretation of one of the monuments at Copan, Honduras.' This is a stone in the form of a deep convex pie, with a round hollow or cup in the centre of the dome, from each side of which a curved line extends to the margin, which is surrounded by a border much like that put on pies by pastry-cooks. The two curved lines form a

sort of S-shaped figure. The whole stone is about a yard and a half in diameter, and its depth about a yard. The two curves are interpreted by Hamy as the sign Taë-Kai of the Chinese, which is venerated by them as symbolic of the essence of all things. Intercourse with China was inferred by Hamy from this sign, corroborated for him by the old story of Fu-sang, first broached by De Guignes in the last century, and by the papers of the late Charles Walcott Brooks on 'Japanese wrecks on the north Pacific coast of America.'

The paper was discussed by Quatrefages, de Charencey, Villemereuil, and others, the general tendency being to accept the idea of intercourse between China, Japan, and America at an early date, especially as Brooks stated that wrecked Japanese were able to communicate with the Aleutian Islanders without an interpreter.

We believe that the very wide hypothesis thus broached, and which in one form or another has had a certain currency for more than a century, rests upon a totally insufficient foundation. That wrecked Japanese, and possibly Chinese, from time to time were cast on the shores of America, is beyond question. The matter has been well discussed by Horace Davis, and to his paper Brooks is indebted for many of his facts. Davidson and others have also drawn attention to the subject. But there is every reason to believe that the wrecked people were, 1°, nearly always males, and incapable of colonizing; 2°, were either killed or enslaved by the Americans in accordance with a general usage; and, 3°, that neither in arts nor language have they left any appreciable trace on American anthropology. The statement of Brooks, that the Japanese and Aleuts could communicate without an interpreter, is true to this extent. I was present when the aforesaid Japanese, three males, were brought to the port of Unalashka, and took pains to inquire into the assertion which was made to me at the time. I found that the communications were wholly by signs, and not by spoken language, as the Aleuts could not understand a word of Japanese without its accompanying signs. Second, Brooks, who was long consul in Japan, informed me that he had particularly searched into the matter of the voyage to Fu-sang, and that he had conclusive evidence that the voyage which actually took place was to the well-known and still existing province of Fu-sang in Korea (see Griffis' work), and had no connection whatever with America. Last, the mere presence of two simple curved lines on a circular stone, taken by itself, proves nothing as to their meaning, and still less that they had any connection with the Chinese symbol.

The temptations of such unbridled hypotheses are the curse of anthropology, and it is extraordinary that such a veteran as Hamy should become entangled in their meshes.

W. H. DALL.

#### AN ARCHEOLOGICAL FRAUD.

AN interesting vase, purporting to be ancient Mexican in origin, was offered for sale some months ago to the American museum of natural history by a collector, and was reserved for possible purchase, and exhibited in the cabinet of that institution. Its grotesque features and the symmetrical and effective combination and arrangement of its ornamentation make it a very noticeable object; but a closer examination destroys the

the highly modern character of the handle in design is flagrantly recent. The artist was unfortunate, also, in selecting a crocodile for this conspicuous 'coigne of vantage,' as that great reptile does not frequent the *tierra templada* of Mexico, and would be only used in art decoration of the aborigines of the hot and lagoon intersected lowlands. The numerous and equidistant circles seen in the photograph on the surface of the cover are fraudulent. The rim of the vase immediately below the cover, upon which the cover rests, is probably a separate piece from the body of the vase, and is too rectangular in its setting on the neck of the same, though very nearly this is seen in genuine examples. Its circular ornamentation is not Aztec. The body of the vase is very meretricious, if the author of this unique object



first pleasurable impressions by raising serious doubts as to its virtual antiquity. It may be serviceable to collectors generally to call attention to this striking instance of very probable fraudulent work, as it is a most elaborate effort of the potter, and to indicate its points of divergence from the veritable specimens of Aztec workmanship. The piece purported to be pre-Columbian.

Beginning at the top of the vase, the cover almost instantly excites suspicion. It is too symmetrically convex and too cap-shaped, while

meant it to resemble true Mexican art. The neck is unnaturally constricted, and the cavity of the vase too globose, in the style of modern ceramic objects of this description. The Aztec moulded the expanded portion or receptacle, in vases of this character, more gradually upwards into the neck, producing a long slant, not a sudden break. The extraordinary collar of masks, which is almost a *chef d'oeuvre* in its way, is a copy immensely improved upon, of similar conceits in genuine antiques, one of which can be seen by New York students in the Metropolitan art

museum, in Dr. Lamborn's collection. But inspection detects glaring contrasts in execution and in detail. The triangular entablatures over the masks are too large and too regular, the masks themselves are not after the trigonometrical style of the Aztec potter, and the mustache-like flaps on the upper lips are strangely inconsistent with any claims for the object as a genuine relic. The expanded flattened chins are anomalous.

The body of the vase, as seen in the cuts, is handsomely ornamented by a face in relief and two semi-disk-shaped annular handles. The face, both as seen in profile and in full view, is not Mexican, and is much too pretty. The fillet surmounting the head should be drawn more closely about the sides of the face, and the V-shaped ends are too large and coarse. The disks attached to the fillet are placed too high, above instead of at or below the ears, and the pendant tassels are abnormally cumbersome. Dr. Plongeon, who agreed with the writer as to the suspicious character of the vase, says that the longitudinal and horizontal bars of these tassels are too few, as they should be respectively five and seven. The handles are very dubious, both from size and ornamentation, while their thin, sheet-like texture is unusual. The legs of the vase are too far under the body of the vase, as in most instances, where present, they sprout from farther up the sides of the object, holding it on inclined supports, and are more usually three in number. The cabalistic ornamentation about and under the vase is significantly coarse and overdone.

The stand, which is seldom found in Mexican pottery, is too elaborate, too highly incised, and false in ornamentation; the markings on its upper surface suggestive of calendar-stones, etc., are simply trifling; and the drop-shaped pellets stuck about it at top and bottom are out of place. The serpents used upon it are wrongly placed; their universal position, I think, being in profile, with usually gaping mouths, while the scroll design between them strikes one as a piece of ingenious but unsuccessful counterfeiting. The whole piece is also too systematically punctured in every part. Since the writer was led to suspect the genuineness of this marvellous production, he has learned from Prof. A. S. Bickmore that Mr. Charnay, in conversation with him, pronounced it a fraud. The aggravated offences so often perpetrated on archeologists by money-making tricksters make it desirable to publish every counterfeit of any importance, both as a warning to the community, of cheats, and as a guide and protection to the less suspicious collectors.

L. P. GRATACAP.

#### A PETROLEUM STEAMER.

THE petroleum trade between this country and Europe has assumed such large proportions, that cheaper means of transportation than the ordinary plan of carrying the oil in wooden casks or metal cases are desirable. Attempts in this direction have been made by fitting ships with cylindrical or rectangular iron tanks, but to this method there were many grave objections. With cylindrical tanks, no matter how closely packed, the result is, that, allowing for the weight of the tanks themselves, the vessel can carry but little more than half her dead-weight capacity. Rectangular tanks, fitting more snugly together, are better in this respect. But in both systems there is considerable loss by leakage; and in the spaces between the tanks, inflammable and explosive gases may be generated, becoming a source of danger.

The attention of ship-builders having been drawn to this important subject, the result is, that a new type of steamer has been devised and constructed for the special purpose of carrying oil in bulk. The Gluckauf, the first vessel of the new type, was built at Newcastle-on-Tyne, to the order of a German firm, and launched last June. She recently completed her first round trip between this port and Germany with a full cargo of oil, and sailed a few days ago for Bremerhaven with her second cargo. The experiment has proved a complete success; and it is stated that other steamers of the same kind, with such modifications of detail as experience suggests, will be built, thus to some extent revolutionizing the oil-carrying trade.

The Gluckauf is an iron steamer three hundred feet in length, and of three thousand tons burden. Externally she has the appearance of an ordinary freight-steamer, except that her smoke-stack is much farther aft, and her half-deck extends forward of the mainmast. Internally she presents some novel features. The coal-bunkers, boilers, and engines are at the extreme stern, in a compartment entirely separated from the rest of the vessel by a water-tight bulkhead. Forward of this bulkhead she is divided into eight oil compartments—four on a side—by transverse and longitudinal bulkheads extending from the ship's bottom to the main deck, two feet above the water-line. From each of these compartments a trunk about eight feet square extends up through the 'tweendecks. These trunks allow of expansion or contraction of the cargo from variation of temperature, and also carry off all volatile gases which may be formed. When loaded, the oil fills the compartments, and extends halfway up the trunks, so that the only surface of oil exposed to

the air or to change of position by the rolling of the ship is that in the trunks. As the cargo is in contact with the skin of the vessel, its temperature will never differ materially from that of the sea. As the bulkheads are water-tight, or rather petroleum-tight, the vessel is practically unsinkable; and, as there is scarcely any woodwork about her, the risk of fire is reduced to a minimum. The Gluckauf is provided with powerful pumping appliances, so that her cargo can be loaded or discharged in a single day, which is another very economical feature as compared with the slow process of handling casks or cases. Altogether the new type of steamer admits of a great reduction in the cost of oil transportation; the only drawback to the system being that such a vessel can get no return cargo, being compelled to make one-half of every round trip in water ballast. But this is not a very important point, as most of the vessels at present in the oil-trade between this port and Europe bring back nothing but empty oil-casks.

#### THE GUADALAJARA POTTERY.

IN a recent number of *Science* the editor, in commenting upon the anthropological section of the American association, says, "Its popularity is at once a good and an evil; its good consists in attracting general attention to the variety and importance of the problems connected with man; its evil, in that this variety and interest are apt to give admittance to papers of too vague and pointless a character, which have no place in the sciences, and neither bring nor suggest any thing new." It may be suggested, in connection with these facts, and bearing upon them, that in a meeting of that character, as well as in the ordinary routine of scientific work, two distinct classes of men are working together, — the collector and the systematizer. From each of these an increased degree of accuracy, as well as greater comprehensiveness, is demanded by the steady advance of science. If we are to reconstruct the history of the past from a study of the present, it is especially necessary that the collector understand the demands resulting from previous researches. Nowhere in the world is better systematizing work in anthropology done than in the United States; and, in order to bring about the reform hinted at above, it is only necessary that the men who take the field as collectors understand the wants of those in charge of our great museums. Officers of the army, navy, and civil service, members of the consular and diplomatic corps, missionaries, and private citizens, show the greatest willingness to enlarge the collections in our museums; and

the information they desire as to how their work shall be most effective should be furnished them.

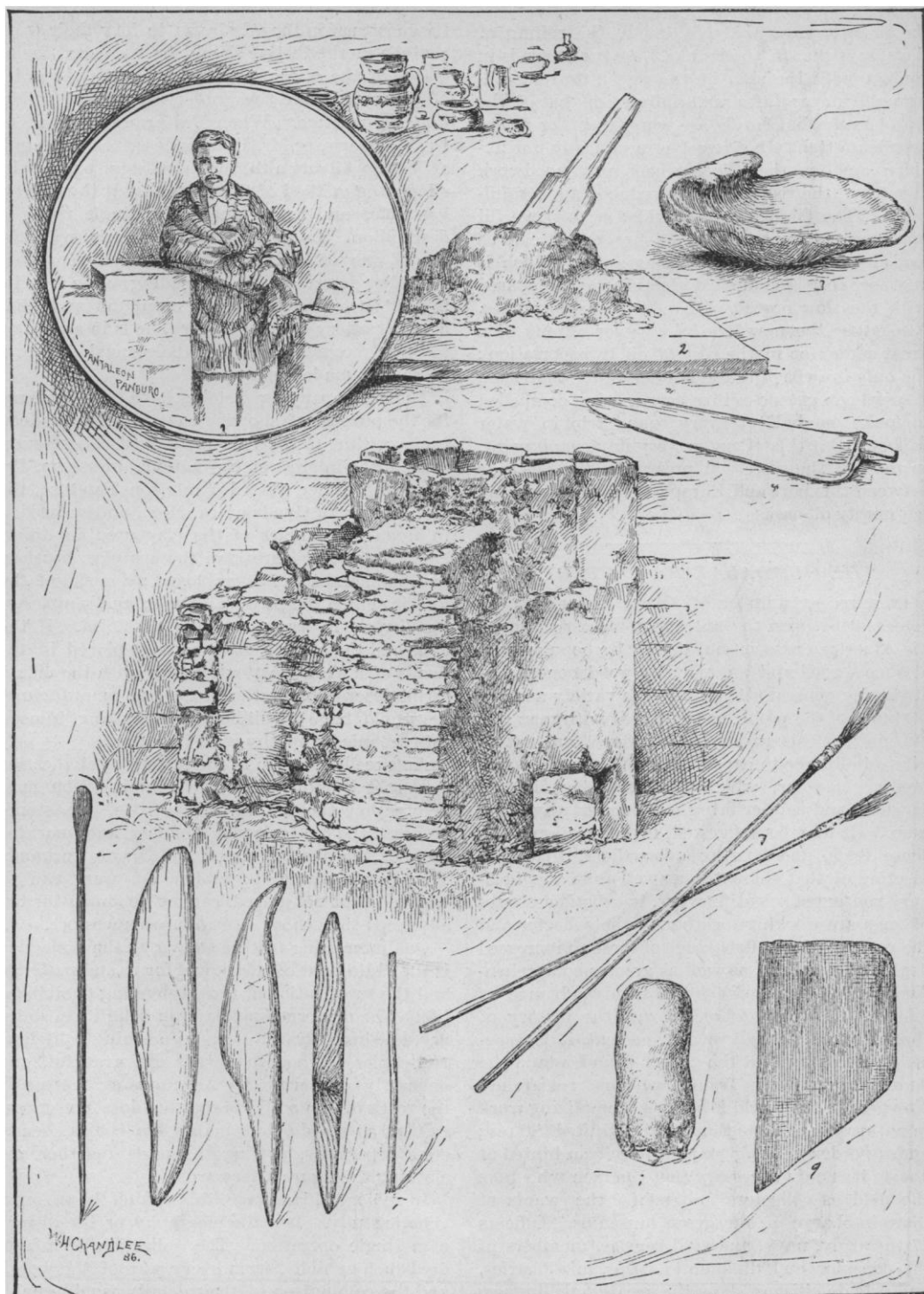
One of the rules prevailing under the new order of things is, make your observations and collections exhaustive. When Professor Putnam, or Dr. Matthews, or Mr. Holmes describes a mound, a Navajo silversmith, or a savage potter, he adopts the method of the anatomist at the dissecting-table, and leaves out not a single item of description. In fact, a good mechanic, with the aid of one of their monographs, can reproduce the thing described. After reading such a description, if one opens a grave or a mound and finds certain pottery or rude jewelry, he is in a position to begin reconstructing the whole social fabric of those who made them.

The accompanying sketches have been prepared for the purpose of showing the results of collecting according to the rule mentioned. Last summer, in the interest of the national museum, Dr. Edward Palmer visited Panteleon Panduro, the noted potter of Guadalajara, Mex., and succeeded in procuring samples of the clay used, in different stages of preparation: the spatulas, brushes, polishers, and scrapers employed; a model of the kiln in which the pottery is fired; and samples of handiwork in various stages of finish. If the tools and the objects collected were placed in the hands of a skilled potter, together with the manuscript description of the process of manufacture, he would have no difficulty in putting himself into technic sympathy with Panduro.

An excellent lesson in the history of civilization is taught by this particular exhibit. You have before you the hand-worked paste, the stone-polisher, the rude wooden shaping and marking tools of the ancient Aztec and Maya workman. The open furnace, in which the ware can be hardened but not glazed, cannot be much further advanced than those of Panduro's ancestors.

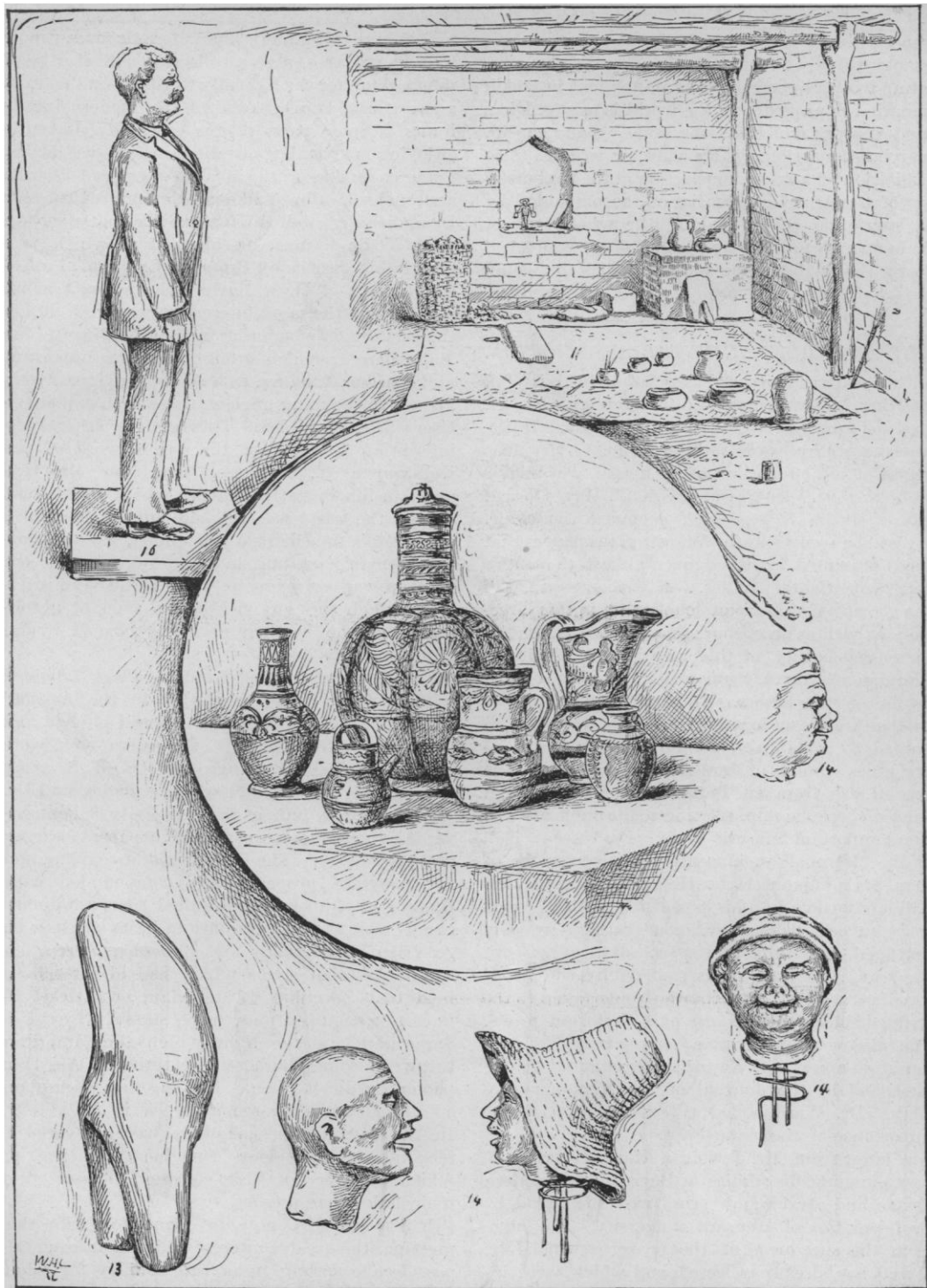
One interesting feature shown by the collection is the fading-out of aboriginal forms and patterns, and the substitution of those belonging to civilized life. The modern Guadalaran delights in statuary, and his portraiture is astonishingly lifelike. His copies of modern vessels are graceful, and delicately ornamented. An amusing feature in the work of the potter is that he does not model *en bloc*, as we do, but makes his bodies, heads, etc., separately, putting the parts together and clothing the figure afterwards.

In zoölogical language, this exhibit is an ontogenetic study. It is the biography or life-history of a single operation. The collection of a hundred such exhibits, from every part of the world, and the comparison of their details, would enable the philosophical ceramist to study pottery philo-



1. — PANTALEON PANDURO, THE GUADALAJARA POTTER.
2. — HIS CLAY BOARD, SHOWING THE RAW MATERIAL.
3. — APPEARANCE OF HIS PASTE WHEN WORKED UP.
4. — SPATULA FOR CUTTING AND SMOOTHING.
5. — FURNACE OF TILES CEMENTED WITH CLAY.

6. — TROWELS AND DECORATING-TOOLS OF IRON OR ROSEWOOD.
7. — BRUSHES FOR PAINTING, BRISTLES OF YUCCA FIBRE.
8. — BURNISHER OF HEMATITE SET IN A CLAY HANDLE.
9. — SCRAPER OF TIN.



10. — STATUETTE PORTRAIT IN TERRA-COTTA BY PANTALEON.  
11. — PANTALEON'S SHOP, BUILT AGAINST A BRICK HOUSE.  
12. — GUADALAJARA WARE, SHOWING FORM AND DECORATION.

13. — MOULD FOR SHAPING PARTS OF THE HUMAN FORM.  
14. — HEADS READY FOR THEIR BODIES.



genetically, or to investigate its distribution geographically. The making of such collections, relating to every occupation or amusement in which mankind in any part of the world is engaged, is a kind of work which may be done by any consul, merchant, missionary, traveller, or soldier. The exhibition of any such collection at the next meeting of the American association, accompanied by a descriptive paper, making the whole subject plain enough for the wayfaring man, would call forth the high commendation which it would most assuredly deserve. O. T. MASON.

#### THE AMERICAN ORIENTAL ASSOCIATION.

THE American oriental association held its fall meeting in New Haven, on Wednesday, Oct. 27, in the library of the Yale divinity school. In the absence of Professor Whitney, who, to the deep regret of all, on account of ill health, was unable to be present, Vice-President Dr. W. Hayes Ward, editor of the *Independent*, occupied the chair. As will be seen from the following, the papers that were presented extended over almost the entire range of oriental studies, — a welcome proof of the growth of American scholarship in this direction, as well as an encouraging sign of the steadily increasing utility of this association. Professor Lanman of Harvard university began by reading two interesting letters. The first, from an attaché to the American legation at Peking, was accompanied by rubbings of a number of Sanscrit inscriptions found in Buddhistic convents. The second was from an Indian gentleman of high rank and scholarship, relating to the publication of some important Sanscrit texts. Prof. Isaac Hall of the Metropolitan museum thereupon spoke of some Syriac manuscripts. He exhibited one which had lately come into his possession, which proved to be an ecclesiastical calendar, rather curiously arranged, containing all the ecclesiastical feasts of the year. Another manuscript which he described gave an account of a journey undertaken to the occident in the middle ages by a Nestorian priest. The discovery of the manuscript created quite a sensation among the Nestorian Christians. It was published in the *Journal of the Missionary society*. Dr. Ward added a few remarks on the importance of the manuscript.

A letter from Mr. Jewett, a Harvard graduate now pursuing his studies at Beyrut, 'On modern Syriac and Arabic proverbs,' was then read by Professor Toy of Harvard university. To judge from the specimens of the proverbs which Mr. Jewett has already collected, and which were indicated in his letter, the entire collection promises to be exceedingly interesting; and, since there is

probably nothing more characteristic of a people than its proverbs, such a collection will also be of much value for the light it will throw on the traits and civilization in general of the modern inhabitants of some parts of the east. Mr. Jewett is enjoying particular advantages for his labors, living as he does in the Moslem quarter of Beyrut, and, indeed, almost like a Moslem. Professor Bloomfield of Johns Hopkins had a paper on some Vedic hymns, an abstract of which was read in his absence by Professor Lanman. Professor Hopkins of Bryn Mawr followed with what was perhaps the most interesting paper of all, on the position of woman in India according to the Mahabharata, which brought out the important fact that her standing, as well as her rights, were greater in the more ancient times than under the later rule of Buddhism. This result is particularly interesting in view of the recent work of the well-known W. Robertson Smith on 'Marriage and kinship in early Arabia,' which shows that exactly the same was the case among the Arabs, where Mohammedanism has tended, while elevating woman's position in some respects, on the whole towards a decrease of the rights and privileges which she enjoyed in the time of 'Ignorance,' as the heathen period is termed by the Mohammedans.

Mr. A. Jackson of Columbia college followed with a paper 'On the similes in the Avesta,' showing the wide range of natural objects and phenomena from which the metaphors were chosen. General Carrington of the U. S. army spoke briefly on the biblical genealogies, and Dr. Morris Jastrow, jun., of the University of Pennsylvania, closed the series with two papers bearing on Assyriology. The first offered an explanation for Assyrian proper names compounded with Budu, and the second embodied the preliminary results of a study of Samaritan in its bearings on Assyrian lexicography and phonology. A number of Assyrian stems which had hitherto been held to be peculiar to Assyrian, or at least so in certain significations, were shown to exist in Samaritan, and the light which the Samaritan throws on some characteristic traits of Assyrian phonology dwelt upon. The meeting thereupon adjourned until the second week in May, 1887. In the evening the members were tendered a reception at President Dwight's residence, at which a number of Yale college professors and their ladies were present.

It is pleasant to note, in connection with this meeting, the greater interest which has during the past decade sprung up in this country for what might be called the more abstract departments of knowledge. Much has been done to dispel that



one-sided view of scholarship and learning which attaches a value only to such knowledge as bears more or less directly upon practical life. Until a comparatively short time ago, the higher study of philology (with the exception of Latin and Greek), archeology, and the like, received but little encouragement in this country; and it is due to this fact alone, that while, in the fields of medicine and the natural sciences, American scholarship has made such rapid strides as to be quite on a par with European nations, in other fields we are still in a state of dependence upon Germany, France, England, etc., and do not hold that rank which is our due. But there are clear indications that a change will soon make itself felt. Such facts as the introduction of Sanscrit in all those higher institutions of learning which aim to stand in the first rank; the creation of new chairs for Semitic languages, Zend, Persian, and archeology;<sup>1</sup> the contemplated fitting-out of expeditions to Egypt, Italy, and Assyria,—are important symptoms, which must not be overlooked. They indicate that a broader conception of scholarship is beginning to prevail, which recognizes the equal importance of all higher studies as such. Whether the field be one which is limited to a few specialists, or one which attracts a large number, is of no consequence whatever from this point of view. To return, therefore, to the point whence we set out, it is a matter of congratulation for the American oriental association to find that oriental pursuits are beginning to receive that recognition which they merit; for there can be no doubt that it is due in some if not in a great measure to the silent influence which that society exerts, that studies bearing on the ancient and modern civilization of the orient, in the widest sense of that word, are rising into greater prominence. And we have no doubt that this influence would be even stronger and more directly felt in the future, if some means were adopted by which the intelligent public could obtain at least a general view, from time to time, of the progress which is being made in these fields of research, so that it may judge for itself of their importance. It might be well for the president of the association to assign to several members the task of presenting at each meeting a summary of what has been done in the various departments of oriental pursuits, the important publications which have appeared, the important discoveries made, and the important projects contemplated. The carrying-out of such a plan would not only make the meetings even more interesting and profitable to the members than they already

are, but would bring the society into that greater prominence which it deserves, and, we may add, *needs*; for it must not be forgotten that an association of this nature exists not only for the purpose of forming a union among those whose sympathies and interests naturally bring them into contact, but that it has a distinct mission to perform,—the advancement of those pursuits which come within its scope. Every step, therefore, taken with this end in view, is not only perfectly legitimate, but will, no doubt, redound to the credit of the society.

With its ranks increased by the younger men who have chosen to devote themselves to oriental studies, the American oriental association can look forward to a still more auspicious future.

M. J., Jun.

#### NOTES AND NEWS.

As announced in the Johns Hopkins university circulars for July, 1886, it is proposed to give a special course in Assyriology during the month of January, 1887. The regular Shemitic courses in Hebrew, Chaldee, Arabic, Ethiopic, Syriac, etc., will be interrupted, and all the time exclusively devoted to Assyriology, now universally recognized as being of primary importance for the scientific study of scripture. Paul Haupt, Ph.D., university of Leipzig, professor of the Shemitic languages in Johns Hopkins university and professor of Assyriology in the University of Goettingen, Germany, will teach Assyrian daily from 3 to 4 P.M. In addition to Professor Haupt's classes, individual instruction will be given three or four hours daily by the fellows in Shemitic languages, Messrs. Cyrus Adler and E. P. Allen, assisted by other advanced students in Assyriology. The hall of the Oriental seminary will be open as a reading-room for those who follow the course. There they will find all the books necessary for the study of Assyrian and the cognate languages, and some advanced students will usually be present to facilitate the access to the exceptionally well equipped Shemitic library, and to furnish any other aid that may be desired. The Oriental seminary possesses duplicates of the most important Assyriological works. Additional copies, as well as the rare publications of Botta, Place, Layard, and others, on Assyrian antiquities, are accessible in the reading-room of the Peabody institute, five minutes' walk from the building of the Oriental seminary. No tuition-fee will be charged. Professors and students of other institutions, as well as clergymen, are invited to attend, and arrangements will be made by which they may easily obtain temporary lodgings, pro-

<sup>1</sup> Yale, Columbia, Princeton, and the Universities of Pennsylvania and Michigan are moving in this direction, and others will no doubt soon follow.

vided an early intimation is received of their intention to come. Letters may be addressed to the registrar of the university.

— Since Koch devised his now well-known method of cultivating micro-organisms on plates coated with gelatine, great advances have been made in bacteriological research. Especially is this true of that branch which deals with bacteria in drinking-water. Dr. Frankland has found, that, in the storage and filtration to which London water is subjected, the number of micro-organisms is reduced ninety-five per cent. Dr. Bolton has shown that the spores of anthrax remain alive in distilled water for ninety days, and in polluted well-water for a year, while the bacilli themselves were very short-lived. The comma bacillus of Koch, as is known, will reproduce itself in water. The importance of these observations is evident when it is considered, that, regarding the germ theory as true, zymotic diseases may be spread by means of water thus impregnated with their germs.

— Hydrophobia is said not to be known in Lapland. To determine whether this was due to any peculiarity in the dogs of that country, or to some other cause, two dogs were brought to Paris, and inoculated by Pasteur. They both contracted the disease.

— The state boards of health in convention at Toronto passed a resolution to the effect that it is the duty of boards of health to notify the boards of neighboring states of the existence of contagious diseases within their borders, and they also pledged themselves to issue such notification.

— Mrs. Woerishoffer of New York has just donated twenty-five thousand dollars to the New York academy of medicine, in memory of her husband, recently deceased.

— The theory which has recently been advanced by M. Verneuil, that tetanus had its origin in the horse, is being strongly combated by a number of medical authorities. In support of his theory, Verneuil directs attention to the rarity of this disease at sea. M. Saint-Vel, among others who do not accept this explanation of its origin, states that tetanus is quite frequent in Oceanica, although on many of the islands there are no horses. He also gives a number of instances where the disease developed on shipboard after the receipt of injuries. Altogether, we fear that M. Verneuil will have considerable difficulty in demonstrating the equine origin of tetanus.

— That training-schools for nurses are growing in popularity is shown by the fact that they are being established all over the country, and are largely attended. The authorities of the school

on Blackwell's Island have just awarded diplomas to twenty-four women who have completed the prescribed course of instruction, and passed satisfactory examinations.

— A restrictive policy in professional and educational matters is never wise. Tulane university, the medical school of Louisiana, is largely dependent for its medical students upon other states, and one inducement offered to its graduates has been the opportunity of obtaining positions on the staff of Charity hospital in New Orleans. In making an appropriation of ninety thousand dollars to this hospital, the legislature provided that only Louisianians should be permitted to compete for these positions. Such a measure can have but one effect; that is, to reduce the number of students at the university.

— In order to prevent the chafing of those portions of the body on which bed-ridden patients rest, and thus to prevent bed-sores, various methods have been devised. The air-bed and the water-bed are well adapted to this purpose, but are expensive, and not always to be obtained. Dr. Smith of Indianapolis recommends the employment of rubber tubing of about three-quarters of an inch in diameter. This can be coiled into any desirable size, and, if soiled by the discharges, can readily be cleansed. Should the parts be inflamed, cold water could be passed through the tube, and thus the heat be reduced. As rubber tubing is cheap and easily procurable, the suggestion is an admirable one.

— A correspondent of the *Medical record* writes that suicides are greatly on the increase in France, and that the Paris morgue is filled with them. In one day seven persons who had taken their own lives were received at this depository for the unknown dead. In 1884 the number of suicides in France was 7,572. Hanging seems to be the favorite method of self-destruction: next in order come drowning, shooting, suffocation by coal-gas, and poisoning. 1,394 suicides were of persons aged from forty to fifty years; 1,508, from fifty to sixty years; and 2,255, from sixty years onward.

— The results of the exploration of the North Sea by the Prussian vessel *Drache* in 1881, 1882, and 1884, are summarized from the official monographic report in the July number of the *Annalen der hydrographie*, with the reproduction of several charts. The salinity at the surface shows the highest percentages (3.50+) in the central area, and a belt of lower values (under 3.00) leading out from the Baltic, around the southern end of Norway. The surface chart of absolute specific

gravity, at existing temperatures, not reduced to a standard, shows the same distribution of values. But descending to thirty or more metres of depth, — all depths being, in true German scholarly fashion, expressed in metres, — an arm of distinctly dense, salt water (3.52+) is seen under-running the lighter water near the Norwegian coast, and approaching the Baltic. The horizontal and vertical variation of temperature is presented in numerous diagrams, and a table contains a condensed statement of the various physical results of soundings.

— Among recent devices patented in this country is a magazine fire-arm provided with a cooling-chamber surrounding the rear portion of the barrel, connected by suitable pipes with a water-reservoir in the stock. At each discharge of the weapon, a pump forces a current of water from the reservoir through the cooling-chamber, thereby preventing the barrel from heating.

— In strong contrast to this country, France is said to be almost entirely without free dispensaries, there being but three in the city of Paris.

— Several sections of an embankment on the North-western state railway, India, were recently washed away, leaving the rails, with their iron sleepers, festooned in the air, like suspension-bridges, the ends of the rails being held together by the fish-plates. Until the floods subsided, so that the embankments could be rebuilt, the mails were carried over these sections of suspended track in hand-cars, the carriers walking on the sleepers, and pushing the cars up the steep inclines, and riding with the mail-bags on the down-grades, sometimes dashing through the torrent beneath.

— Anhydrous aluminium chloride is now prepared by the following process: aluminium alloy is heated in a retort to between 200° and 300° C., hydrochloric-acid gas is then passed over the heated alloy, and the vaporized aluminium chloride thus obtained is condensed. The right to this process is owned by the Cowles electric smelting company of Cleveland, O., who use it in connection with the reduction of aluminium from clay in the electric furnace.

— A series of articles on the prevention of fire, which first appeared in the columns of an architectural journal, has recently been published in revised pamphlet form by the author, William Paul Gerhard, under the title 'The prevention of fire.' Though written chiefly with reference to hospitals, asylums, and other public institutions, much may be found in the pamphlet that applies equally well to churches, schools, factories, hotels, and even to dwelling-houses.

— The 'Index to the literature of explosives,' part i., by Charles E. Munroe (Baltimore, *Friedenwald*, 1886), is intended to embrace not only such articles as treat of the composition and of the chemical and physical properties of explosives, but also of their manufacture and use in the arts. This part contains the titles of papers appearing in such periodicals as the indexer has been able to review from the date of first issue. Four hundred and forty-two volumes have been thus reviewed for this part. Many other titles of papers have been collected, but the indexer has not yet had access to complete sets of the periodicals from which they have been gathered. A large number of titles of separate publications, treatises, text-books, and the like, have also been collected. It is hoped that it will be possible to eventually publish these, together with a 'subject' and 'author's' index to the entire list.

— During the spring of 1886, Ticknor & Co. began the publication of "Ye olden time series, or, Gleanings from the old newspapers, chiefly of Boston and Salem," with brief comments by Henry M. Brooks of Salem, Mass. In this series there are now ready, vol. i., 'Curiosities of the old lottery;' vol. ii., 'Days of the spinning-wheel in New England;' vol. iii., 'New England Sunday;' vol. iv., 'Quaint and curious advertisements;' and the present vol. v., 'Literary curiosities.' Among those to come are volumes on 'Some strange and curious punishments;' 'New England music in the latter part of the eighteenth and in the beginning of the nineteenth century;' 'Travel in old times, with some account of stages, taverns, etc.;' and 'Curiosities of politics among the old federalists and republicans.'

— The forthcoming volume of the 'Encyclopaedia Britannica' will get down as far as *sia*, and will contain an unusual number of important articles. That on Shakspeare by the editor, with a bibliography supplied by Mr. H. R. Tedder, will attract most attention. Mr. Matthew Arnold writes upon Sainte-Beuve, Mr. James Sims on Schiller, Mr. Rossetti on Shelley, Professor Minto on Sir Walter Scott, Madame Villari on Savonarola, Mr. Saintsbury on Rousseau, and Mr. J. S. Reid on Ruhnken. Of the art articles, M. Hymans contributes that on Rubens, and Professor Middleton that on schools of painting. Russia falls to Prince Krapotkine and Mr. Morfill, and Scotland is treated by no fewer than five writers. Of the scientific articles, that on Rotifera is by Professor Bourne of Madras; that on series, by Professor Cayley; seal, by Professor Flower; and Schizomycetes, by Professor Marshall Ward.

— The *Athenaeum* is authority for the state-

ment that the life of Charles Darwin, by his son, which will be published before Christmas, will contain an autobiographical chapter dealing chiefly with the great naturalist's religious opinions.

— Mr. William Saunders of London, Ontario, has been appointed chief director of the Dominion experimental farms of Canada, and has in consequence given up the editorship of the *Canadian entomologist*, a monthly journal which he has conducted for many years. The former editor, Rev. C. J. S. Bethune of Port Hope, will succeed him.

— An international railway exposition and congress will be held in Paris from May to October, 1887, when a railway jubilee of the fiftieth anniversary of railroads in France will be celebrated. John W. Weston, editor of the *American engineer*, Chicago, has been appointed commissioner-general for the United States.

— Lieut.-Col. W. T. McLeod sends us a brief account of the weather of two summers as observed by him at Nassau on the Bahamas. It would seem from the frequency of heavy rains, thunderstorms, and tropical cyclones, to be quite unlike the mild winter climate of the islands that invalids seek to enjoy. The following description of a passing cyclone reveals the characteristic reversal of its central winds: 'On Thursday, Aug. 19, 1886, at 9 A.M., the barometer began to fall, and continued to do so gradually up to 12 o'clock noon on Sunday, Aug. 22. From this hour it fell rapidly up to 4 A.M. on Monday, to the extent of 7-10 of an inch. The barometer remained steady for half an hour, and then rose as rapidly to its previous height. During this depression a severe gale raged. At about 6 P.M. the sun went down in a yellowish patch, with a purple haze. The cloud-masses were blown out into rain-film. The rain fell and the wind blew in gusts from the east, and continued to blow from east to south-south-east, up to 3.45 A.M. on Aug. 23, with increasing force. A lull occurred, and, as the barometer shot upwards, the wind shifted and blew furiously from west-south-west from 4.30 A.M. up to 7.30 A.M. During this gale several lives were lost and schooners wrecked. Lightning accompanied the gale.'

— At a meeting on Oct. 19, of the committee of the subscribers to the British school of archeology at Athens, according to *Nature*, Professor Jebb said the school had been erected and paid for, Mr. F. C. Penrose had been appointed director, and a provisional income of £400 a year for three years had been raised, but additional funds were required. Prof. C. T. Newton, in urging the im-

portance of having a great school of archeology, suggested that there should ultimately be raised a special fund for the payment of the travelling expenses of the students at Athens. On the motion of Professor Jebb, a managing committee was appointed.

— Messrs. Whittaker & Co. have issued a book by Mr. William Anderson, "On the conversion of heat into work, a practical hand-book on heat-engines."

#### LETTERS TO THE EDITOR.

\*.\*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

##### The deepest fresh-water lake in America.

IN the issue of your journal of the 27th of August are contained some remarks on Crater Lake in Oregon, and its remarkable depth. The perusal of these remarks leads me to say a few words with regard to another lake in the extreme eastern portion of the continent, which, though far from approaching that mentioned, has nevertheless a depth, as well as some other features, which are quite exceptional. I refer to Lake Temisconata in the Province of Quebec.

This lake is situated very near the axis of the divide between the waters of the St. Lawrence and those of the St. John, its outlet by the Madawaska River forming one of the main tributaries of the latter stream. Its total length is twenty-eight miles, about eighteen of this having a general direction a little east of south; while the remainder, forming the more northerly position, trends to the north-east nearly at a right angle with the former. The breadth varies from one to three miles. Throughout its length and on both sides, the land is usually high, forming numerous ridges and promontories projecting into the lake, but just at the angle referred to one of these, known as Mount Wissick or Mount Essex, rises almost precipitously to a height of 550 feet, while the opposite shore is here quite low. The height of the lake above tide-water is, by aneroid, about 400 feet; the distance of the upper end from the St. Lawrence being thirty miles, while the length of its actual discharge, by way of the Madawaska and St. John to the Bay of Fundy, is 288 miles.

Having had occasion to spend some time about the lake during the last summer in connection with the work of the Canadian geological survey, and having heard incredible stories as to its depth, means were taken to ascertain the truth by a number of soundings at points which seemed to promise the best results. Of these, three, taken near the foot of the lake, gave a depth varying from 215 to 225 feet; farther north a depth of 410 feet was reached; and midway between Mount Wissick and old Fort Ingalls, 500 feet. It seems probable, however, from the statements of reliable parties, that even this depth is at some places considerably exceeded.

In the case of Crater Lake, if one may judge from its name, its depth is no more than one might expect from the conditions of its origin; but in the case of Lake Temisconata there is absolutely nothing of a volcanic character, and the whole depression is evidently the result of simple erosion. That that erosion

should have occurred to a depth fully 100 feet below tide-level, and that, too, directly along the line of the great Appalachian axis, is certainly remarkable. It is further singular, that while the ledges along the shores of the lake are covered with glacial striae, corresponding generally with the course of the depression at the point where they occur, the transportation of bowlders has been largely to the north, blocks of fossiliferous limestone from the beds of Mount Wissick being abundantly scattered about the upper end of the lake, but not to the southward. The country between the head of the lake and the St. Lawrence has not yet been examined, but along certain lines is believed to be low. The Madawaska, on the other hand, flowing almost due south, occupies a drift-filled valley, bordered by high and steep hills similar to those of the lake, and probably marks its former extension in this direction. It would seem as if lake and river formed together a great transverse channel of erosion, the result of sub-aerial action, from the St. Lawrence to the St. John, at a time when the entire region stood several hundred feet higher than now, and that the movement of the ice was in the direction of the former. The fact that the direct northward extension of this depression is coincident with the famous gorge of the Saguenay gives additional interest to the observations mentioned.

L. W. BAILEY.

Fredericton, N.B., Oct. 23.

### Coloring geological maps.

Professor Branner has issued a neat little card containing a colored geological map of the state of Indiana, on a scale of 1:4,878,720, or 77 miles to the inch! In a letter, which, from its having been written in French, is probably designed to be widely distributed in Europe as well as this country, he complains, 1°, that, with the scale of colors provisionally adopted by the International congress, it is not possible to employ a color which shall indicate the Devonian without specifying whether the area be upper, middle, or lower. Professor Branner will be convinced that he is mistaken if he will look at the report of the committee on the geological map of Europe (Amer. com. rep., p. 43, b), where in such a case it was suggested (and later approved by the congress) to use the medium shade of color accompanied by the characteristic letter of the system (in this case, d), but without any one of the indices 1, 2, or 3 (see Amer. com. rep., p. 103, for the conclusions of the map committee, arrived at after the meeting of the congress).

Professor Branner complains also that the difficulty of indicating four or five divisions in the carboniferous is greater still. This is not surprising on a map-scale of closely one-five-millionth. The congress never contemplated such a problem, though even here the individual geologist is expressly left free to employ his ingenuity to differentiate by means of tints and symbols, the only restriction laid upon him being that the base of the tint used shall be gray. This certainly opens the way to any method of differentiation which he may desire to try.

Professor Branner misunderstands the object of the congress if he supposes that the color-scale was adopted only for the geological map of Europe, and not for the use of all the geologists of the world. The fact is, that the geological map of Europe was simply selected as a lay figure on which to display the pres-

ent 'provisional system.' If it be found that this system is bad, another will be substituted for it; but it will require more proof than Professor Branner furnishes to convince geologists of this.

If the 'carbonic' of Europe can be adequately represented by the proposed system, there is good ground to hope that the carboniferous of Indiana will not present insuperable difficulty; but not while the human eye remains what it is can any one succeed in displaying geological details at a scale of one-five-millionth and on a paper surface already one-third covered with printer's ink, representing names of towns and counties and railroad lines.

It is only fair to add that the system proposed by the congress will come as near to satisfying this impossible demand as any other. PERSIFOR FRAZER.

### Air from a cave for house-cooling.

I wish your opinion upon a matter in which I am much interested. Grand Avenue cave, situated four miles from Mammoth cave, contains some nine miles of avenues filled with delightfully cool, pure, dry air; temperature 55°. I propose to erect a house immediately over this cave; make the outside walls and partitions all hollow, so that they may communicate with a cellar, which shall be connected with the cave by a large shaft, say, eight feet square. The question is, will the air between the house and cave take the temperature of the cave by diffusion or otherwise, or will it be necessary to use mechanical means to get the air into the building? I have seen and spoken to several scientific men on the subject, who agree with me that an interchange of air will take place, and continue until equilibrium is restored by making the temperatures the same.

It is proposed to erect a hotel for a cool-air summer resort, and also for a sanitarium. If you think proper, I would like you to put this before the readers of your valuable periodical, and get the benefit of their opinions. It is a matter of some scientific interest, in which physicists, geologists, and sanitarians may be interested.

M. H. CRUMP.

Ogden college, Ky., Oct. 26.

### Zinc in Moresnet.

In your issue of this date, on p. 383, you speak of tin ore being found at Moresnet. This is a mistake. The county contains, however, some of the most important zinc-mines of Europe. Almost every collection of minerals contains some specimens of zinc taken from these very interesting and important mines.

THOS. EGLESTON.

New York, Oct. 29.

### Ely's Labor movement in America.

A newspaper discussion in criticism of any particular article or review is rarely profitable, but it seems necessary to make a brief reply to the communication of Professor Ely published in *Science* for Oct. 29.

Professor Ely charges that his reviewer, while apparently neither an untruthful nor malevolent person, failed to read the book in question before noticing it. Inasmuch as every statement of Professor Ely's which is mentioned in the review is accredited to the page on which it occurs, his allegation is of

course groundless. As a matter of fact, the present writer read Professor Ely's book with more than usual care, not only because it dealt with a question in which he feels a deep personal interest, but because of its general attractiveness of style. When, therefore Professor Ely denies that his reviewer read the book, he evidently is writing in a Pickwickian sense—or else he must mean that his reviewer did not read the book with the author's eyes, which is not beyond the bounds of possibility.

Professor Ely's attention is called to the fact that it is not usually considered candid to eliminate from a quotation any word or clause that distinctly modifies its import. When, therefore, his reviewer wrote, that "while not over-clear on this point, yet he [Professor Ely] seems to uphold the extremists in their contention that all the evils of the present state of society are due to private property and the lack of proper co-operation in production and distribution," he expressed an opinion which the freedom of the press will probably permit him to continue to hold. Professor Ely should have read and quoted it in full. Professor Ely dissents from that opinion, but his reviewer repeats it just as it was first stated. An honest difference of opinion is often serviceable rather than otherwise.

As a further instance of what his reviewer intended by the modest statement that Professor Ely seemed to him to have "committed the not uncommon scientific error of reading his theory into the facts, instead of deducing it from them," may be cited Professor Ely's majestic waving away of one or two well-known facts regarding workmen without grievances striking because of the interference of some walking delegate or other, with some rather eloquent references to a knowledge of human nature.

In fact, it is altogether to be regretted that Professor Ely should consider one of the most favorable notices of his book, that has appeared in any journal of authority, to be 'grossly careless.' Such an attitude seems to ascribe, perhaps, more honor than is their due, to the reviewers for the *Nation*, and for that organ of the socialistic party of which Professor Ely speaks. So we feel doubtful as to just what opinion Professor Ely entertains regarding his book. The general tone of his communication to *Science* would seem to indicate that all criticism of the book, to be just, must be laudatory: the 'grossly careless' phrase inclines us to the belief that the reviewers of the *Nation* and of the organ of the socialistic labor party may have most accurately reflected the judgment of the author. In either case, the present writer must crave Professor Ely's permission to disagree with him.

The published expression of the train of ethical thought to which the same notice of Professor Ely's book gave rise in the mind of 'One of the agitators,' at least calls for the recognition of the honor done your reviewer in coupling his humble initials with the great name of Aristotle. N. M. B.

#### A manual of lithology.

A critic should carefully inform himself concerning the contents of a book before he attempts to review it, and should criticise the stand-point taken, or adapt his review to that stand-point. This is my excuse for noticing the prodigious mauling of so small a corpse as my 'Lithology.' It is allowable to object to the plane from which a subject is viewed;

but, if it be premised that a certain method is to be followed, a criticism of the faults imposed by that method show that the critic failed to familiarize himself with the necessary facts. Had he acquired such a familiarity, he would have seen that it was designed, not for specialists, but for the very classes to whom he says it may be of value; that a knowledge of mineralogy was presupposed (see preface), and that the treatment of that science was in the shape of a brief review of a few of the more common minerals; that the discarding of the microscope swept away all facts dependent upon that instrument for verification, required the use of old-fashioned terms existing before that instrument changed the nomenclature, and opened the doors for many 'blunders' as viewed by the microscopist. While it may be debated whether it be worth while to attempt to impart so brief an idea of the commoner rocks, it is a fact that such a method has been employed here for a score of years in the regular technical and scientific courses, and that the work is to be covered in twenty exercises. Looking at the criticism from this stand-point, it has overshot its mark, and shows that the writer has mistaken the book for a pretentious claimant for recognition on the score of novelty or advanced method of treatment, while, in fact, it is designed for those who would acquire, in the shortest possible time, an idea of the rocks most commonly met with in the field.

EDWARD H. WILLIAMS, JR.

Bethlehem, Penn., Oct. 30.

#### The abuse of dispensaries.

Your editorial on 'The abuse of dispensaries' (*Science*, viii. 380) gives occasion to call attention to the charity organization societies and their function. Such societies exist in the cities you mention, at least in London, Boston, New York, and Philadelphia. These societies are clearing-houses of information in relation to the people who beg or accept gratuitous relief. They keep registries, both alphabetic and geographic (at least, this is the case in New York and in Washington), of such persons, and make it their business to ascertain the condition and needs of all persons about whom inquiry is properly made. The principle upon which they work is the following: every church, institution, or person dispensing relief is invited to report to the society the name and residence of and pertinent information about persons aided; they are advised to dispense no relief before ascertaining from the society what it already knows about these persons. If report is made that relief has been extended to any person who is known by the society to be receiving aid from other sources, all parties giving aid are informed of the duplication. If it is known that any person is not receiving adequate relief, the society directs the attention of some appropriate relief-giving agency to the need, or directs the needy to the appropriate agency. This is the application of scientific methods to the solution of the social problems of pauperism and fraudulent and unnecessary solicitation of alms, and is destined to succeed. The dispensaries could well afford, as could all other relief-giving agencies, to apply a large percentage of their funds to the support of the charity organization societies, for the sake of the economy which would therefrom result in their other expenditures.

B: PICKMAN MANN.

Washington, D.C., Oct. 29.

# SCIENCE.—SUPPLEMENT.

FRIDAY, NOVEMBER 5, 1886.

## CABLE STREET-RAILWAYS.

It is proposed to 'gridiron' New York City with cable street-railways. The network, as projected, embraces about seventy miles of double-track road, consisting of a number of distinct routes, with branches, all connected together so as to form one comprehensive system. Of this, fifteen miles will be elevated, the rest surface roads, but all

number of cable-railways in the city and suburbs, before many years, to enable the general public to judge of their merits.

The history of cable traction as applied to street-railways dates back only a few years, though cables moved by stationary engines had been used on tramways in the principal collieries of England and Germany long before the advent of the locomotive. In 1830 a railway between Liverpool and Manchester, in England, — the second of the kind constructed, — was approaching completion,

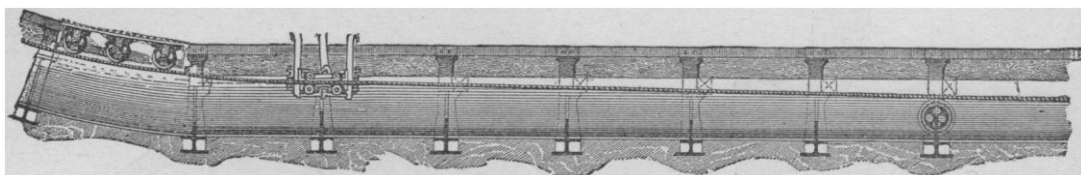


FIG. 1.

operated by cable traction. That this comprehensive scheme will be carried through to completion is not yet certain. There is much opposition to it, not only from property-owners along the proposed routes, but also from railroad companies with whose interests it would conflict. Cable-railways have been in use in San Francisco for thirteen years, giving better satisfaction for street

and George Stephenson, the eminent engineer, was one of four commissioners appointed to decide whether the road should be worked by stationary engines and wire cables, or by locomotives. It

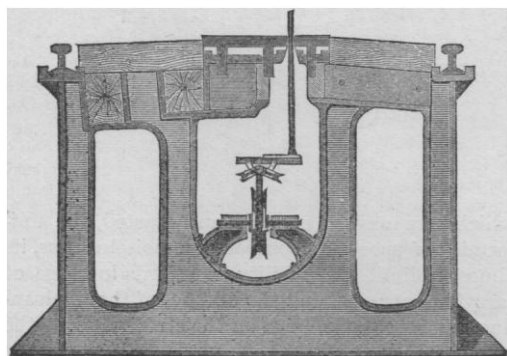


FIG. 2.

purposes than either horse or steam railways. Many other cities, in both Europe and America, have given cable traction a fair trial, and with results satisfactory to the travelling public as well as to the owners of the roads. There are already several miles of cable-road completed and running in the northern part of this city; and, even if the contemplated network throughout the city should never be constructed, there will be a sufficient

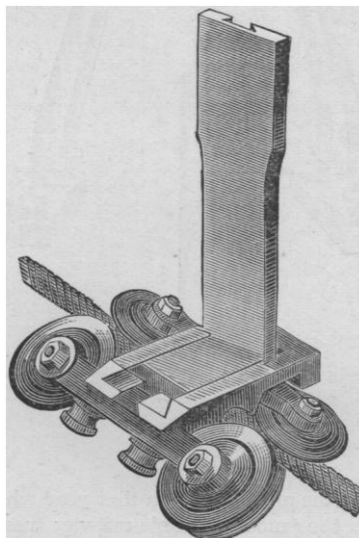


FIG. 3.

was decided to use locomotives, though two of the commissioners strongly favored the cable system, as the locomotive was still in its infancy. In his report to the officers of the road, Mr. Stephenson said, "Fixed engines with ropes are most suit-



able for hilly countries, where the gravity of the horse as well as of the locomotive engine becomes a material part of their whole power." The use of wire cables for haulage purposes on inclined planes, especially in mining regions, had steadily increased as necessity demanded, but no special adaptation of the cable system to street-car trac-

cable system to street-cars, on a grade too steep for the economical use of either horses or locomotives, was in accordance with the views advanced by Stephenson thirty-three years before; but so many and so obvious are the advantages of cable traction, as demonstrated by the Clay Street and other roads, that it is rapidly taking the place of horses on level streets; and it is even being urged as a substitute for the locomotive on the London underground railways, as well as in other places where the smoke, noise, and gases of the locomotive are objectionable. Among the advantages of the system are, its applicability to steep grades as well as to levels, the ease and gentleness with

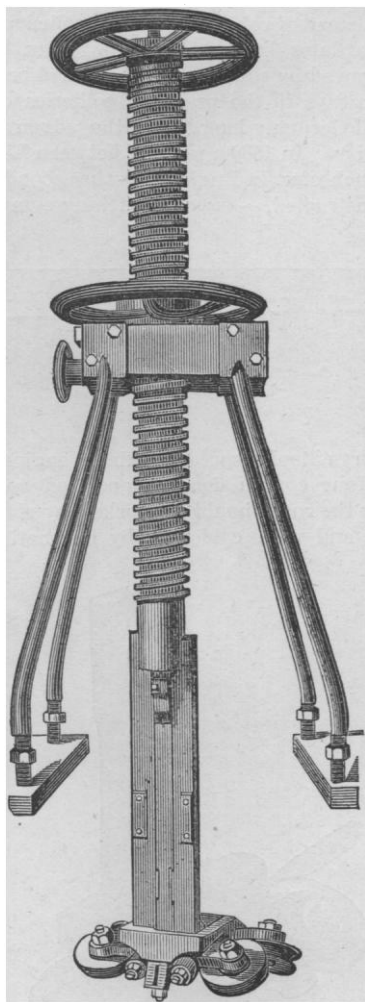


FIG. 4.

tion was made until 1873. In that year what may be termed the 'modern' cable-railway was introduced, the first application of it being made on the Clay Street hill road in San Francisco, Cal. This road was about half a mile long, on a narrow street, with grades of one foot in five and a half feet. That road has been in continuous operation ever since.

It will be seen that this first application of the

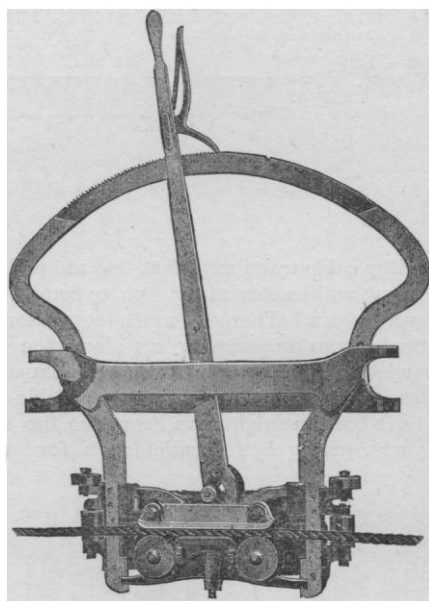


FIG. 5.

which cars may be stopped and started, the uniformity of speed, its comparative noiselessness, its almost unlimited capability as regards increase of carrying capacity, and the absence of the uncleanness, unavoidable, both on the streets and at the stables, wherever horses are used. Although the use of horses for many purposes in cities can never be entirely dispensed with, — unless in such a place as Venice, — the more general use of a mechanical motive power for street-railways would greatly lessen their number.

The cable system consists of an endless steel or iron wire rope, moving continuously in a slotted tube placed beneath the surface of the street and between the rails. The rope is supported at intervals by pulleys, depressed by smaller pulleys at

points where steep grades are crossed by level streets, carried around curves by guide-rollers, and kept in motion by a steam-engine located at any convenient point on the line of the road. A gripping device at the end of a thin vertical steel plate, or combination of plates, connected with the car and passing through the slot in the tube, transmits the motion of the cable to the car, the speed of the car being determined by the speed of the cable, and usually not exceeding about eight miles per hour in city streets. The action of the grip is controlled by a grip-man, who, by the movement of a lever or hand-wheel, can start or stop the car as gently or as suddenly as may be desired. Fig. 1 is a longitudinal section of the slotted tube in use on the Clay Street hill road. At the extreme left are shown the depression pulleys at the intersection of a level cross-street with an ascending grade. The weight of the car on the grip keeps the latter sufficiently depressed at such points to clear the pulleys. At the right is shown a supporting pulley. A transverse section of the tube, with its surrounding framework, which supports the rails, is shown in fig. 2. The gripping device in use on the Clay Street road is shown in fig. 3, and its operating mechanism and supporting framework are shown in fig. 4. The gripping-jaws, which close on the rope between the pairs of guide-sheaves, are moved by the upper hand-wheel, while the grip may be raised or lowered bodily by the lower wheel. The guide-sheaves, which are kept in contact with the cable by springs when the gripping-jaws are released, guide the cable smoothly between the jaws when the car is not in motion, holding it in position for gripping when it is desired to start the car. Many modifications of the grip have been devised, in most of which the jaws move vertically instead of horizontally; but with the exception of the Paine grip, used on the East River bridge, the essential features in all are the same, and they differ only in detail from a grip described and illustrated in a technical journal nearly fifty years ago. Figs. 5 and 6 show two varieties of lever-grip now used on many roads.

As frequent and careful inspections of cables and machinery are required, and as on many roads cars are run continuously night and day, a duplicate or duplex system has been found necessary, of which the Tenth Avenue line in this city may serve as an example. In this system two cables run side by side through the tube, each supported by a separate set of pulleys, and provided with a separate engine. While one cable is running, the other is held in reserve; and, in case of accident to one cable or engine, the other may be immediately started up, the grips, which are made

double for the purpose, releasing one cable and taking up the other. The engine-room of the Tenth Avenue line is shown in fig. 7, and the arrangement of duplex cables and pulleys may be seen in fig. 8. The cables may be run alternately, and for any desirable length of time, giving ample

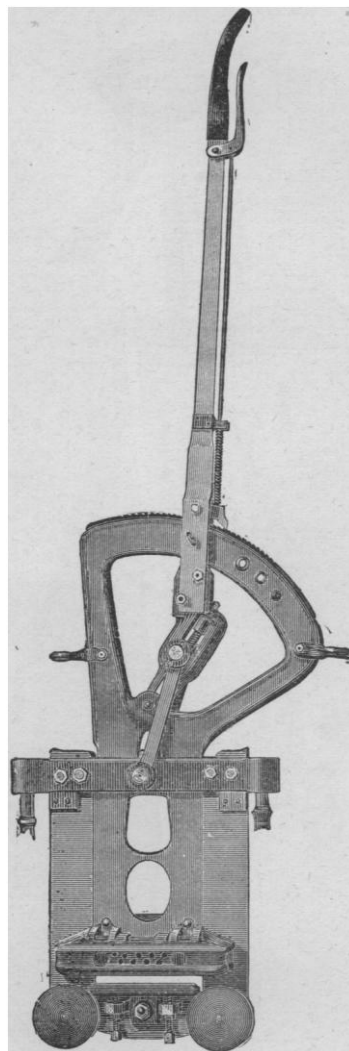


FIG. 6.

opportunity for inspection and repair without interruption of travel. As will be seen in the engraving, there are two complete plants of machinery; and as they are duplicates, a description of one will suffice for both. The motive power for each plant is a Wright automatic cut-off engine of three hundred horse-power. A six-foot wheel on the engine-shaft gears into a thirteen-foot

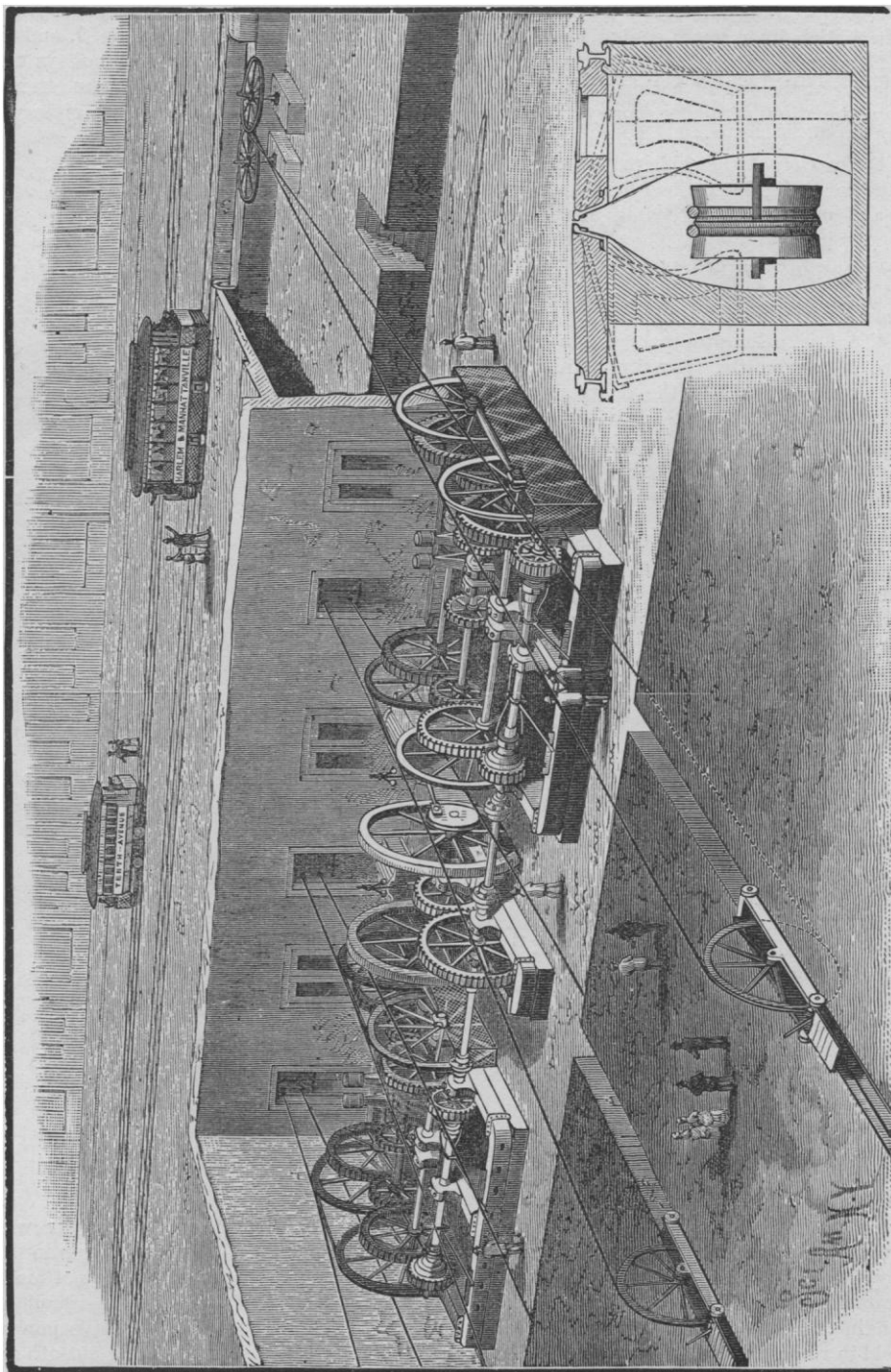


FIG. 7.—ENGINE-ROOM OF THE TENTH AVENUE CABLE-RAILWAY.

FIG. 8.

wheel on the line-shaft, which is a foot in diameter and about fifty feet long. The line-shafts of both plants may be coupled together, so that either engine may be used to drive either section. Each section carries two pairs of cable-drums, either pair of which may be thrown into or out of action by clutches. Thus either engine may be

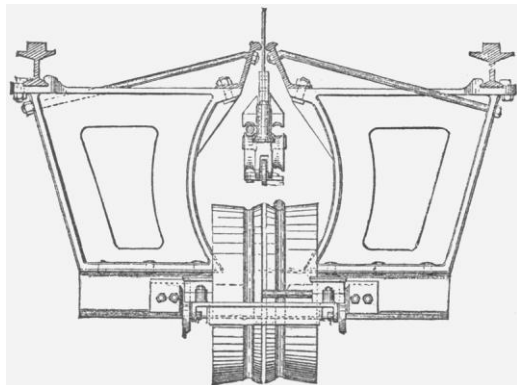


FIG. 9.

used to run any of the four cables shown in the engraving. The section at the right actuates the duplex cables running out Tenth Avenue; that on the left will be used for the 125th Street branch of the company's line.

The cable, coming from one of the guide-pulleys in the street, shown at the right of the en-

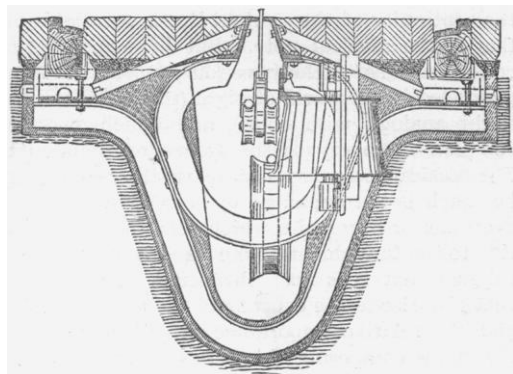


FIG. 10.

graving, passes several times around both cable-drums, thence around a 'slack-pulley,' shown in the foreground, from which it passes back around one of the guide-pulleys in the street, and back on its way through the tube. The 'slack-pulley' is mounted on a car which is moved by a differential lever in such a manner that the cable is always kept at a uniform tension. Thus the lengthening and shortening of the cable through variations of temperature, etc., is compensated for.

The grip used for the duplex system, as well as the tube, pulleys, and track-supporting framework, is shown in fig. 9, which is a transverse section of the Tenth Avenue road. The framework and tube used on the Chicago cable-railway is shown in transverse section in fig. 10, which also shows one of the guide-rollers for carrying the cable around a curve. The road-bed of the cable-railway in this city has a framework of iron, as shown in fig. 9, concrete forming the sides and bottom of the conduit or tube. The transverse trusses are placed five feet apart, with the slot-rails and track-rails bolted to them. The slot-rails form the sides of the longitudinal slot of the tube, and they are held firmly in place by tie-rods which connect them with the outer edge of the truss. Pulley-vaults are provided at intervals of thirty-five feet, affording access to the carrying-pulleys. A system of drainage-pipes connects these vaults with the city sewers, thus securing perfect drainage, which cannot be affected by any dirt that may accumulate in the conduits. The carrying-pulleys are twenty-two inches in diameter, and are placed in pairs, one a little in advance of the other, to support the two cables independently.

The first cable street-railway, that on Clay Street hill, San Francisco, was looked upon as an experiment to a great extent; but after a satisfactory trial of three years, the system having proved itself a mechanical and financial success, a second road was constructed, also in San Francisco. This was followed by others in rapid succession, until that city has at present upward of twenty miles of cable-road in operation. Other cities followed the lead of San Francisco, St. Louis with sixteen miles, Philadelphia with twelve, Chicago with ten, Kansas City with eight, and many more with shorter lines, so that at present the total length of double-track cable street-railway in the United States will not fall far short of one hundred miles. Taking into consideration with this the fact that cable-roads are making rapid headway in Europe, Mexico, Australia, and New Zealand, it will be seen that the new system of street-car traction has proved its right to a prominent position in railroad economics.

#### THE PHYSICAL BASIS OF AESTHETICS.

AESTHETIC impressions may be conveniently divided into two classes: in the first it is the appreciation of qualities furnished immediately by sensation that gives rise to beauty, while in the second class the sense-impressions are interpreted and made significant by a guiding thought or emotion. Though the two often go together, there is

a class of aesthetic impressions depending pre-eminently on the sensations furnished by the great aesthetic educators of the race, — the eye and the ear. It is to the explanation of these simple forms of beauty that M. J. L. Soret devoted an address delivered before the Swiss society of natural science.<sup>1</sup> The field is by no means a new one, but perhaps so convenient a statement of the problem has not before been available.

The arts depending upon the eye are those in which form is the predominant element, — sculpture, architecture, etc., — and those in which color plays the important rôle. If we look for the physiological basis of beauty of form, we find one great principle in symmetry, especially in symmetry about a vertical axis. If we stand in this plane of the vertical axis, and look at the symmetrical object, the impression on the retina of the right eye will closely correspond to that on the retina of the left eye. The recognition of similarity, so essential and useful as a logical habit of mind, seems at the same time to furnish the emotional element of aesthetic pleasure. The fact that we recognize and enjoy symmetry when not standing opposite the centre of the object is the result of our education : we recognize that the two retinal impressions would be alike if we assumed that position.

It may be well to introduce here a distinction between intellectual and aesthetic pleasure, in which M. Soret has great confidence. It is this : the pleasure caused by the solution of a problem is due to a conscious reasoned analysis ; an aesthetic pleasure is caused by an unconscious intuited analysis. The one is laboriously and slowly wrought out : the other is readily and suddenly revealed. This distinction is best illustrated, as will be seen, in the analysis of tone : the analysis of form is so simple that we can readily perform it consciously.

Proceeding with this analysis, we find a second principle in the repetition of design. It leads to the mathematical conception of a periodic function. We see it represented in friezes, in a series of columns, in ornaments, etc., even in those belonging to the most primitive periods of art. As before, there is the recognition of similarity ; and, as before, this similarity may be greatly diversified, so long as the artistic education of the beholder enables him to recognize the fundamental regularity. A third character of beauty of form is continuity of lines and surface : a straight line is an important artistic element. This is again a repetition of design, for the several parts of a straight line are again straight.

What, then, is the origin of this intuition that

gives rise to aesthetic pleasure? It is the recognition of equality, — the simplest conception furnished by the senses. The ear recognizes when two sounds are of the same pitch, as well as when two intervals of time are alike : equalities of space are appreciated by sight as well as by touch. This recognition of equality, of the identity or the repetition of two sensations, reveals an order in the objective world, and the intuition of this regularity gives pleasure. The degree of pleasure depends on the universality and importance of the regularity thus revealed, and on the vividness and the variety of the sense-impressions. And what we mean by ugliness is not the lack of regularity which we see in a stone, for example : that is aesthetically indifferent. But that is ugly in which we recognize a law, but see that law violated. An unsuccessful attempt at symmetry is ugly. A piece of goods in which the pattern to be repeated shows irregularities in size and execution belongs in the same category.

Passing now to sounds, we have simply to translate the language of space into that of time. The repetition of design finds its parallel in rhythm, and both are capable of endless complications. When we consider that poetry, music, dancing, even ordinary speech, that the organic functions such as the pulse, respiration, sleep, locomotion, and many of the acquired habits of mind and body, are all subject to a periodicity, the importance of rhythm is strongly impressed. Again : the continuity of the straight line is paralleled by that of the musical note. But here and in the consideration of melody we touch upon a fact unparalleled in the world of sight (though there is a slight analogy with color), and which owes its complete discovery to the genius of Helmholtz. The musical notes are not simple in their character, but each is accompanied by a certain series of overtones or harmonics which bear a definite relation to the fundamental note ; and it is a wonderful fact that it is just this series of harmonics that give rise to the octave and the musical scale ; and the relative importance and distinctness of the notes composing this series of harmonics is exactly mirrored in the historic development of the scale from the earliest times to the present.

Long before it was known that sound was a periodic motion of vibrating air particles, in times when the counting of these minute vibrations would have been regarded as a miracle, the intuitional instinct of the untutored ear had already selected that pair of notes the vibration rates of which had the simplest ratio of one to two, as the basis of aesthetic sounds. It had performed unconsciously but correctly that analysis for the conscious discovery of which we required all the

<sup>1</sup> *Revue scientifique*, Sept. 2, 1886.

refinement and skill that centuries of scientific education could furnish. Does this not suggest a conception of law, of rationality, of an adaptation between the human mind and the external world, which is not yet fully appreciated?

Besides the repetitions due to rhythm and the scale, there are the more complicated ones due to the repetition of phrases and arias. The *Leitmotiv* and the variations of a theme are examples of more complex modes of musical repetition. The laws of harmony reveal the same tendency towards a recognition of identity, in combination with those numerical relations which underlie the formation of the scale. The appreciation of the more complicated harmonies depends on natural gifts as well as on musical training.

M. Soret considers the aesthetic aspects of color as regards mixture, juxtaposition, repetition, in a similar way; and, though there are many suggestive analogies thus brought out, the subject is hardly sufficiently well known to warrant precise statements.

The final portion of the address is devoted to the beautiful in nature. In the animal world symmetry is certainly evident; and though this symmetry is not perfect in various attitudes, still we readily recognize its nature; and, in fact, this mobility is itself pleasure-giving. In the lower forms of life, repetition of design, as the stripes of a zebra, the markings of a caterpillar or a butterfly, is abundant. Continuity and roundness of outline is certainly a prominent feature of animal forms. The mutilation or natural defect of parts of the body spoils the regular effect, and is thus ugly. Of course, as regards man, the animal which we know so intimately, the psychic elements play an active part in the conception of beauty; but these are not now under consideration. By comparison we erect a type, an ideal, and judge of beauty by its conformity to that ideal.

Turning to the vegetable world, we find exquisite symmetry, graceful outline, and repetition of design, represented as before. And into that combination of foliage with sky and earth which forms scenery, these elements enter, but do not sufficiently explain the enchanting effect of beautiful landscape. In short, there is a physical basis of aesthetics; but it is far from perfectly understood, and in part is so closely connected with higher aspects of beauty, that its nature remains unrevealed.

J. J.

THE Lehigh valley railroad is to be equipped with the Phelps system of train telegraphy, by which moving trains can be kept in constant communication with headquarters or with any station on the line of the road.

# RECENT PALEONTOLOGICAL PUBLICATIONS.

*Revision of the Palaeocrinoidea.* Part iii. By C. WACHSMUTH and F. SPRINGER. Philadelphia, W. P. Kildare, pr., 1886. 8°.

WACHSMUTH and Springer have issued separately an extract from the Proceedings of the Academy of natural sciences, forming an octavo of some two hundred pages, and containing a discussion of the classification and relations of the brachiopod crinoids with the conclusion of the generic descriptions, errata, and a full index. This important work forms part iii. of their revision of the Palaeocrinoidea, and will be indispensable to all students of that remarkable group of animals. The total number of genera recognized is 156; of species, 1,276. Sixty-one of the genera are exclusively American; forty-eight, exclusively European; forty-six are common to both hemispheres; one is peculiar to Australia. The authors do not claim that all the species included and referred to their proper genera in their list are actually well founded: on the contrary, many may prove eventually synonymous with previously described forms. However, there are numerous undescribed species; and the writers claim that at least one hundred such are contained in their own collection, to be hereafter described and completely illustrated in a monograph of the Palaeocrinoidea of North America. The group formerly described by them as the family Ichthyocrinidae, with the addition of *Crotalocrinus* and *Enallocrinus*, is now erected into a sub-order, *Articulata*, containing two families, — the *Ichthyocrinidae* and *Crotalocrinidae*. Further indication of the details of a work which is in itself a synopsis are impracticable within the limits to which we are restricted, — a fact which we regret the less, since all those directly interested will, without doubt, possess and profit by the original.

*Geological survey of Alabama.* Parts i. and ii. By T. H. ALDRICH and O. MEYER. Tuscaloosa, *Geol. surv.*, 1886. 8°.

Bulletin No. 1 of the geological survey of Alabama, directed by Prof. E. A. Smith, forms the first contribution toward a work undertaken by Mr. Truman H. Aldrich, illustrating the paleontology of the tertiary formation in Alabama. This work, which is to be the gift of Mr. Aldrich to the state of Alabama, will embrace figures and descriptions of all the shells found in the tertiary deposits of the state, including reproductions of figures published elsewhere, and, when finished, will be one of the most complete works of the kind published by any state.

In the preparation of this bulletin, Mr. Aldrich has personally gone over the greater part of the ground, and has collected a large part of the ma-

terial himself. He has thus been able to give to each species, not only its locality, but also its stratigraphical position.

The bulletin contains a preface by the state geologist, together with a summary from his forthcoming report, of the subdivisions of the various deposits which make up the tertiary formation in Alabama, and a description of their stratigraphical and lithological features. Then follows Mr. Aldrich's paper, including notes and descriptions of species, with a summary of their geological and geographical distribution, illustrated by six well-executed plates. Mr. Aldrich, besides many new species, describes a new genus, *Expleritoma*, which somewhat resembles an ecarinate *Magilus* with the tube broken off. The species *E. prima* comes from the Claiborne sands.

Mr. Aldrich's paper is succeeded by one in which Dr. Otto Meyer describes some species of eocene fossils from Alabama and Mississippi. It is illustrated by three plates. Dr. Meyer also gives us a new genus of pteropods, which he calls *Bovicornu*, differing from *Styliola* by a slight spiral twist. It is from the eocene of Red Bluff, Mississippi.

These publications will stimulate and encourage the study of the tertiary fossils of the United States,—a field hitherto left to a very few workers, and of late almost neglected. All paleontologists will wish success to Mr. Aldrich in his praiseworthy undertaking.

*Brachiopoda and Lamellibranchiata of the Raritan clays and greensand marls of New Jersey.* By R. P. WHITFIELD. Washington, Government, 1885. 4°.

Volume ix. of the monographs of the U. S. geological survey is a report on the fossil Brachiopoda and Lamellibranchiata of the Raritan clays and greensand marls of New Jersey, by Prof. R. P. Whitfield. It was made to Professor Cook, state geologist of New Jersey, who, deeming it worthy of a place in the series of monographs, transmitted it to the director of the national survey, together with a sketch of the geology of the cretaceous and tertiary formations of New Jersey. This is illustrated by sections. The whole volume comprises three hundred and thirty-eight pages and thirty-five admirable plates, quarto. The Raritan clays are considered to be cretaceous by Professor Cook, though some paleontologists have considered the estuary forms sparingly found in them to closely resemble those of the Wealden or Jurassic age. Mr. Whitfield seems to incline to this view. The greensand marls are unquestionably cretaceous, and overlie, conformably, the clays. The majority of the fossils described in the report are of this age. Those from the plastic clays are mostly internal casts, poorly preserved in a friable matrix, which is also strongly impreg-

nated with pyrites; so that, unless immediately soaked in glue, collections soon decompose and crumble, leaving no organized traces behind. The beds at the top of the marl-bed appear to be eocene, though showing some transitional features.

The types have been gathered from many sources, the state collection having only a small part of them. The earlier types are nearly all lost, owing to the decomposition above referred to, which affects the marl fossils as well as those from the clays.

These fossils attracted the attention of paleontologists at an early day. Morton and Vanuxem began describing them in 1828. The bringing-together of the scattered literature and correcting it to date will prove of much value to students; and the work, representing the labor of the pioneers in paleontology on this continent, will remain a standard of reference for a long time to come.

*Ambonicardia* is proposed for a form referred to the Veniliidae and related to *Veniella*; *Meleagrinnella* and *Gervilliopsis*, for new forms of *Aviculidae*. The total number of species treated of is two hundred and thirty-two, of which seven belong to the Brachiopoda. An edition of this report with the state imprint has been issued at Trenton, N.J., as 'Paleontology of the cretaceous and tertiary,' vol. i; but it is, for all practical purposes, exactly the same work.

THE glaciation of the Lackawanna and Wyoming valleys, in north-eastern Pennsylvania, has afforded Prof. J. C. Branner interesting material for a detailed local study, published in the recent *Proceedings of the American philosophical society*. The district is of value as being on the line of farthest glacial advance. The author finds that the ice, when at its greatest thickness, was influenced only by the greater average features of the surface; and consequently what appears to have been an upward movement of the ice is upward only in a local sense. Further, as the ice thinned by melting, its southern margin became more and more under the influence of local topography, and the directions of the striae are changed. Professor Branner does not follow Kjenelf in regarding the preservation of older striae under divergent lines of later formation as evidence of no significant glacial erosion, but rather as showing the small power and short duration of the thin ice-margin that made the later striae. The paper includes two contoured maps, with striae printed in red, and accounts of boulders, pot holes, new channels, and other related questions.